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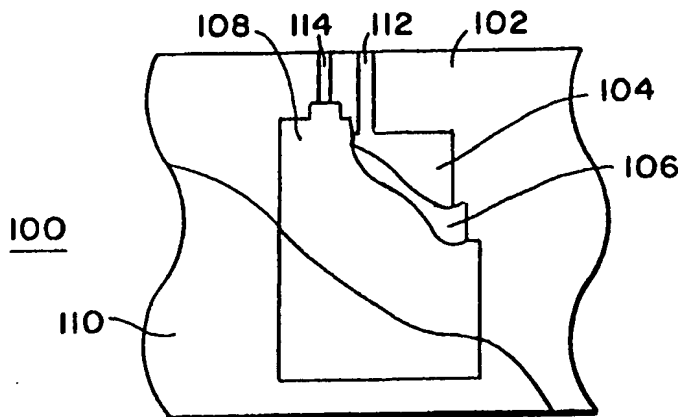
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(54) Title: ELECTROLUMINESCENT LAMPS FOR VEHICLE LIGHTING

(57) Abstract

The invention comprises the incorporation of an electroluminescent lamp (100) or lamps for vehicle lighting products for improved safety and decorative appeal. The electroluminescent lamp (100) being of either the parallel plate or split electrode configuration with a power supply or a means for supplying power incorporated therewith.



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ELECTROLUMINESCENT LAMPS FOR  
VEHICLE LIGHTING

1. Field of Invention

The present invention relates to electroluminescent lamps, and more particularly, the to use of electroluminescent lamp systems for, and in combination with, vehicle light.

2. Continuation

This application is a continuation of Serial Number 08/393,084 for Method for Manufacturing Electroluminescent Lamps, filed 2/22/95;

3. Description of the Prior Art

The prior art and its uses are discussed in detail in the current inventor's pending applications Serial Number 08/393,084 for Method for Manufacturing Electroluminescent Lamps, filed 2/22/95; Serial Number 08/431019 for Illuminated License plate Frame using an Electroluminescent Lamp, filed on April 28, 1995 and Serial Number 08/482,302 for Method for Manufacturing Electroluminescent Lamps systems, filed on June 7, 1996. Those application discuss the conventional manufacturing methods of silk screening and a continuous method lamination process resulting in a parallel plate and a rear split electrode construction and the current inventors inventions regarding methods for

manufacturing electroluminescent lamps and lamps systems with this application being a continuation of Serial Number 08/393,084 for Method for Manufacturing Electroluminescent Lamps, filed 2/22/95.

Prior uses of electroluminescent materials for use in and for vehicle lighting has been more of a curiosity with little or no commercial application and use because of the cost prohibitive nature of electroluminescent lamps and the inability to easily construct lamps and systems for use with vehicle lighting products.

The current invention uses the low cost method of the above noted application for cost effective and ease of use of electroluminescent lamps for use in combination with their application and use appealing to safety and decorative needs for price sensitive consumer applications such as vehicle lighting products.

#### SUMMARY OF THE INVENTION

The current invention comprises the combination of low cost electroluminescent lamps for vehicle lighting products for improved safety and decorative appeal. An embodiment of the current invention of the use of electroluminescent lamps for vehicle lighting products incorporates a rear split electrode electroluminescent lamp construction.

An alternative embodiment of the invention combines the use of an electroluminescent lamp having a parallel plate construction for vehicle lighting products.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a cross-sectional view of the embodiment of a parallel plate constructed electroluminescent lamp for use in the current invention.

Fig. 2 is a top view of the embodiment of a parallel plate constructed electroluminescent lamp for use in the current invention.

Fig. 3 is a cross-sectional view of the embodiment of a rear split electrode constructed lamp for use in the current invention.

Fig. 4 is a top view of the embodiment of a rear split electrode constructed lamp for use in the current invention.

Fig. 5 illustrates the current invention on an automobile.

Fig. 6 illustrates the current invention on motorcycle.

Fig. 7 illustrates an alternative embodiment of the current invention on an automobile

Fig. 8 illustrates the current invention generally in the interior of an automobile.

Fig. 9 illustrates an alternative embodiment of the current invention on a

dashboard.

Fig. 10 illustrates a schematic of the present invention.

Fig. 11 illustrates an alternative embodiment of the present invention.

Fig. 12 illustrates the current invention in a cross-sectional view.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following exemplary discussion focuses on the use of the low cost electroluminescent lamp produced by the method of the parent application for low cost consumer applications such as vehicle lighting products.

Referring to Fig. 1 , a cross sectional view of a first exemplary electroluminescent lamp (EL) lamp 100 constructed in accordance with the method disclosed in the parent, where Lamp 100 includes paper or plastic core stock 102, rear capacitive electrode 104, EL Phosphor layer 106, front conductive Indium-Tin-Oxide (ITO) layer 108 and clear electrical insulator 110. Note that layers 106 and 108 both overlap rear capacitive electrode 104 in order to provide electrical isolation between layers 106 and 108, while allowing layer 108 to make contact with a metal foil power conductor. Capacitive electrode 104 is permanently bonded to paper or plastic core stock 102 using a nonconducting bond compound. EL phosphor layer 106 provides a precise definition of the area

of illumination, while avoiding any waste of the expensive phosphor ink.

Fig 2 is a top view of lamp 100. As shown in fig 2, capacitive electrode 104 and EL phosphor ink layer 106 define a rectangular area of illumination. However, the specific shape of the area of illumination is not limited to simple rectangles, circle or polygons. Any pattern with which phosphor ink may be printed onto capacitive electrode 104 may define the area of illumination. Continuing with Fig. 2, metal foil conductors 112 and 114 are used to provide electrical power to rear capacitive electrode 104 and front conductive ITO layer 108. When appropriate alternating current (AC) power source is connected to conductors 112 and 114, current flows through EL phosphor ink 106, thus providing illumination. The mechanical structure of EL lamp 100 provides a lighting source which is light-weight and flexible.

Referring now to Fig 3, a cross-sectional view of a second exemplary EL lamp 200 is constructed where lamp 200 includes paper or plastic core stock 202, rear capacitive electrode 204, EL phosphor layers 208 and 210, front conductive ITO layers 212 and 214 and clear electrical insulator 216. Rear capacitive electrode 204 is permanently bonded to paper or plastic core stock 202 using a non-conducting bonding compound. EL phosphor layers 208 and 210 provide a precise definition of the area of

illumination, while avoiding any waste of the expensive phosphor ink.

Fig. 4 provides a top view of exemplary EL lamp 200. As shown in Fig. 4, rear capacitive electrode 204 and EL phosphor ink layers 208 and 210 define a pair of rectangular areas of illumination. However, the specific shape of the areas of illumination is not limited to simple rectangles, circles or polygons. Any pattern with which EL phosphor ink may be printed onto capacitive electrode 204 may define the area of illumination.

Referring to Fig. 5, a automobile 300 has EL Lamps 301, 302 and 303 attached to the automobile being power by the electrical system of the automobile with elements not shown. License Plate 305 has its letters and numbers illuminated and powered when either the parking lights or headlights are turned-on. The lighted license plate indicia 306 makes it easier for vehicles to be identified at night. The EL lamps 301, 302 and 303 are placed on the location on the automobile for purpose of illustration and not limitation. The use of the EL lamps in this embodiment will improved the ability to see the automobile at night and in bad weather and fog, thereby, improving vehicle safety. The EL lamps will also improve the decorative appeal of the automobile.

Fig. 6 illustrates an alternative embodiment of the EL lamps



incorporated on a motorcycle 400 at 401 and 402. As with the automobile above, the location of the EL lamps are for illustrations and could be placed on various other locations on the motorcycle. The EL lamps could be powered by the electrical system of the motorcycle or an alternative power source such as a battery or solar cells and battery. Also illustrated in Fig. 6 is a helmet 450 with EL Lamps 451 and 452. The position and location of these EL Lamps are for illustration and could be placed anywhere on the helmet 450. The power supply could be in the helmet or hooked into the motorcycles electrical system. The EL lamps 401, 402, 451 and 452 in this manner would improve night safety and improve the decorative appeal of the helmet 450 and motorcycle 400.

Fig. 7 illustrates an alternative embodiment of the present invention where it is used to create lighted indicia 501 on door 502 of automobile 500. The indicia could not only be Police, but also could be for other municipal vehicles, taxis, limos and for advertising on autos, truck and buses. Again, the lighted indicia would make municipal vehicle stand-out at night for easier identification for those in danger and the lighted indicia would improve advertising on vehicles. As above the power to light the EL lamps could be from the vehicle or batteries or solar cells with batteries.

Fig. 8 illustrates another embodiment of the present invention with automobile 600 having its interior speaker grills 601 illuminated by EL lamps 602. The rocker panel 603 has EL lamp 604 to light the entryway or illuminate the manufacturer of the vehicle or whatever indicia that an owner or manufacturer would desire. The interior 611 of door 610 can be illuminated with an EL lamp as well as area 607. The entire interior of the vehicle could be accent illuminated. This use is easily transferrable to a bus or truck interior. Again vehicle 600 has an illuminated license plate indicia 605.

Fig. 9 is another embodiment of the current invention having an illuminated dashboard panel 700 having illuminated areas 702, 703, 704 and 706 with power and data supply cords 705 and 706. The dashboard could be animated with various read-outs. The style of dashboard is for illustration and other styles are obviously possible.

Fig. 10 illustrates a typical schematic of the lamp system 800 having lamp 805, power supply 801, illuminated area 803 and adhesive or mounting side 804.

Fig 11 illustrates another embodiment, an encapsulated EL Lamp System 900 having EL lamp 902 with power supply 901 with transparent or translucent cover 910. The power supply could also be an inverter

circuit to use the vehicle's electrical system. This unit 900 could be mounted as molding on a vehicle, as safety light or as decorative lighting. The encapsulation can take on various methods of encapsulation using plastics such as extrusion.

Thus, the low cost vehicle lighting EL Lamp items will improve the safety of the participants by making them more noticeable and will also improve the decorative appeal of the items.

The foregoing description includes what are at present considered to be the preferred embodiments of the invention. However, it will be readily apparent to those skilled in the art that the various changes and modifications may be made to the invention. Accordingly, it is intended that such changes and modifications fall within the spirit and scope of the invention, and that the invention be limited only by the following claims.

What is Claimed is :

1. A improved safety lighting comprising:
  - (a) an electroluminescent lamp;
  - (b) a vehicle
  - (c) a power supply for said lamp.
2. The invention of claim 1 where said lamp is attached to the surface of the vehicle.
3. The invention of claim 1 where said lamp is attached to the exterior surfaces of said vehicle.
4. The invention of claim 1 where said lamp is incorporated in the molding around said vehicle.
5. The invention of claim 1 where said lamp is incorporated for mounting in the interior of said vehicle.
6. The invention of claim 1 where said lamp is attached to the door of said vehicle
7. The invention of claim 6 where said lamp is attached to said door and said door has illuminated indicia.
8. The invention of claim 3 where said lamp has illuminated indicia.

9. The invention of claim 5 where said lamp has illuminated indicia.
10. The invention of claim 1 where said lamp is encapsulated in a transparent or translucent material for attachment to the exterior of said vehicle.
11. The invention of claim 1 where said vehicle is a automobile.
12. The invention of claim 1 where said vehicle is a bus.
13. The invention of claim 1 where said vehicle is a truck.
14. The invention of claim 3 where said vehicle is a automobile.
15. The invention of claim 3 where said vehicle is a truck.
16. The invention of claim 3 where said vehicle is a bus.
17. The invention of claim 9 where said vehicle is a automobile.
18. The invention of claim 9 where said vehicle is a truck.
19. The invention of claim 9 where said vehicle is a bus.
20. Vehicle decorative light comprising:
  - a EL lamp incorporated with a vehicle;
  - a power supply.
21. The invention of claim 20 where said lamp is attached to the surface of the vehicle.
22. The invention of claim 20 where said lamp is attached to the surface of the vehicle.

23. The invention of claim 20 where said lamp is attached to the exterior surfaces of said vehicle.
24. The invention of claim 20 where said lamp is incorporated in the molding around said vehicle.
25. The invention of claim 20 where said lamp is incorporated for mounting in the interior of said vehicle.
26. The invention of claim 20 where said lamp is attached to the door of said vehicle.
27. The invention of claim 26 where said lamp is attached to said door and said door has illuminated indicia.
28. The invention of claim 23 where said lamp has illuminated indicia.
- 29.. The invention of claim 25 where said lamp has illuminated indicia.
30. The invention of claim 20 where said lamp is encapsulated in a transparent or translucent material for attachment to the exterior of said vehicle.
31. The invention of claim 20 where said vehicle is a automobile.
32. The invention of claim 20 where said vehicle is a buš.
33. The invention of claim 20 where said vehicle is a truck.
34. The invention of claim 23 where said vehicle is a automobile.
35. The invention of claim 23 where said vehicle is a truck.

36. The invention of claim 23 where said vehicle is a bus.
37. The invention of claim 29 where said vehicle is a automobile.
38. The invention of claim 29 where said vehicle is a truck.
39. The invention of claim 29 where said vehicle is a bus.
40. A vehicle light comprising:
  - a electroluminescent lamps having indica incorporated in a dash board for vehicle information;
  - a power supply to illuminate said lamps; and
  - a data supply to illuminated said lamps with said vehicular information.
41. The invention of claim 40 where said vehicle is a automobile.
42. The invention of claim 40 where said vehicle is a truck.
43. The invention of claim 40 where said vehicle is a bus.
44. A vehicle light comprising:
  - a license plate having said plate's indica illuminated by electroluminescent illumination for improved visibility of said plate.
45. The invention of claim 44 where said vehicle is a automobile.
46. The invention of claim 44 where said vehicle is a truck.
47. The invention of claim 44 where said vehicle is a bus.

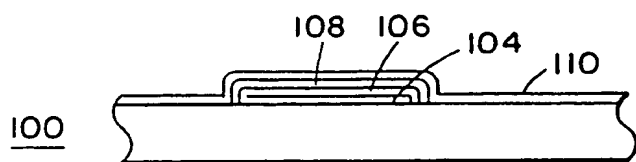


FIG. 1

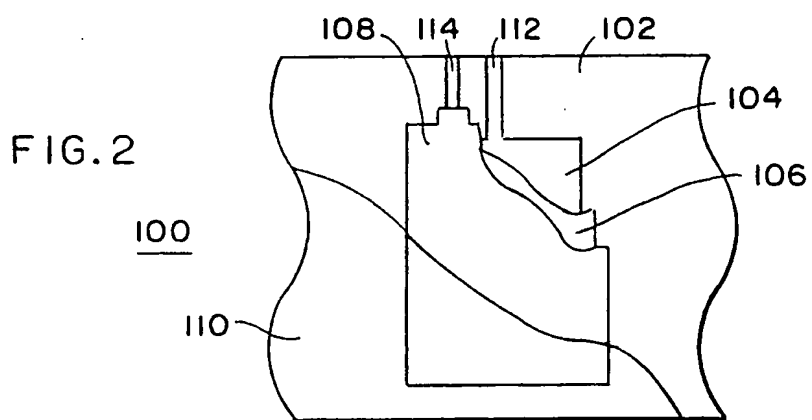


FIG. 2

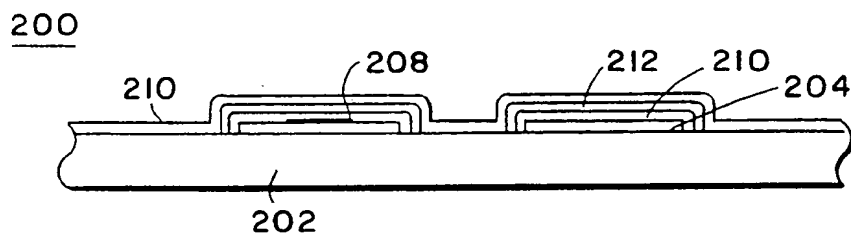


FIG. 3

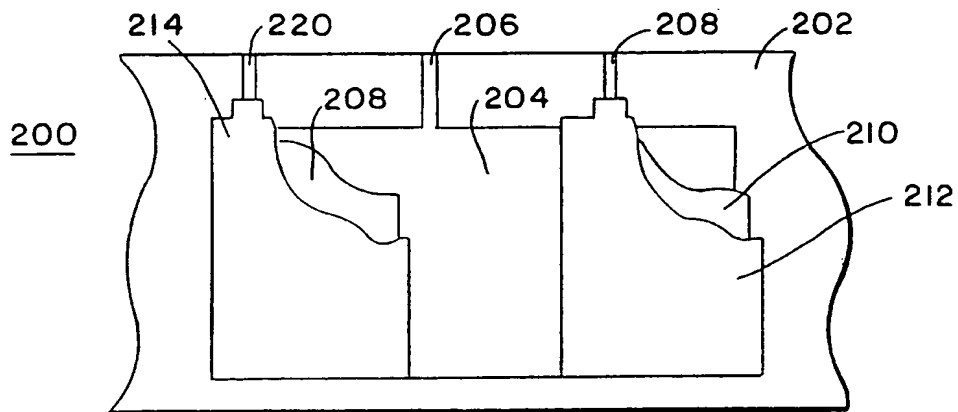


FIG. 4



FIG.5

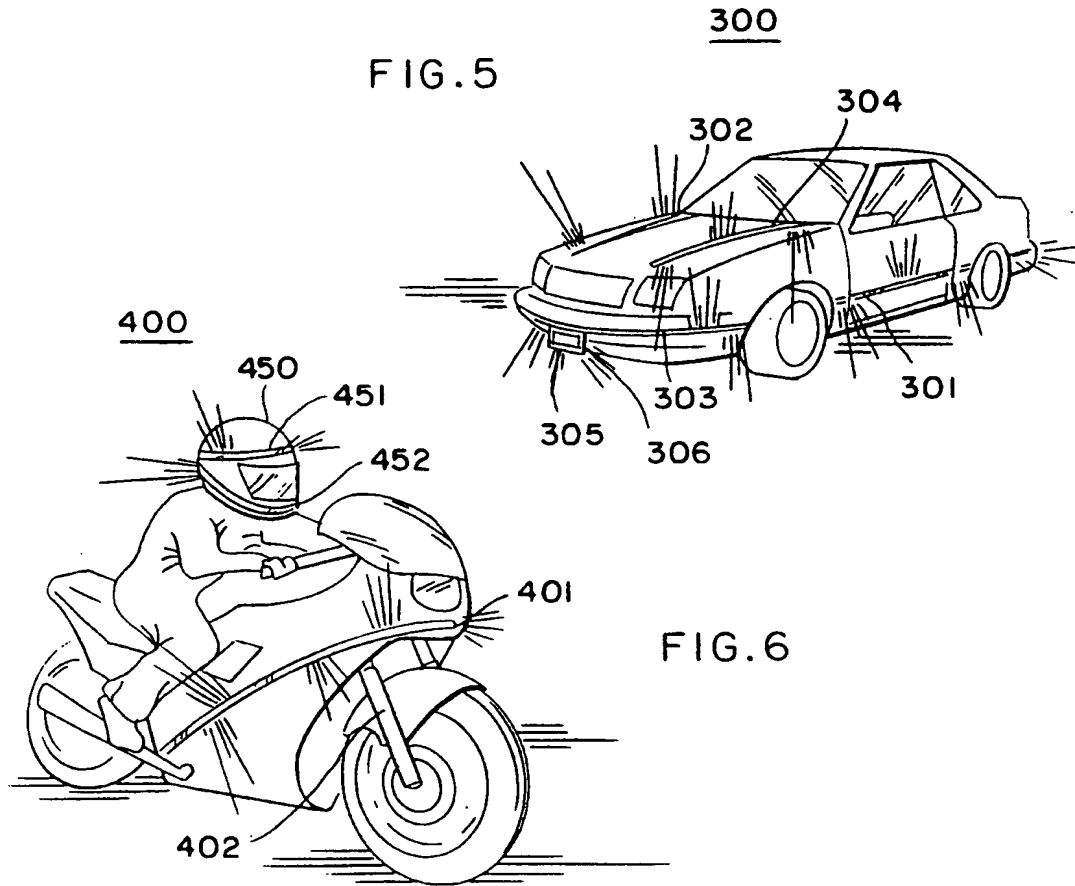


FIG.6

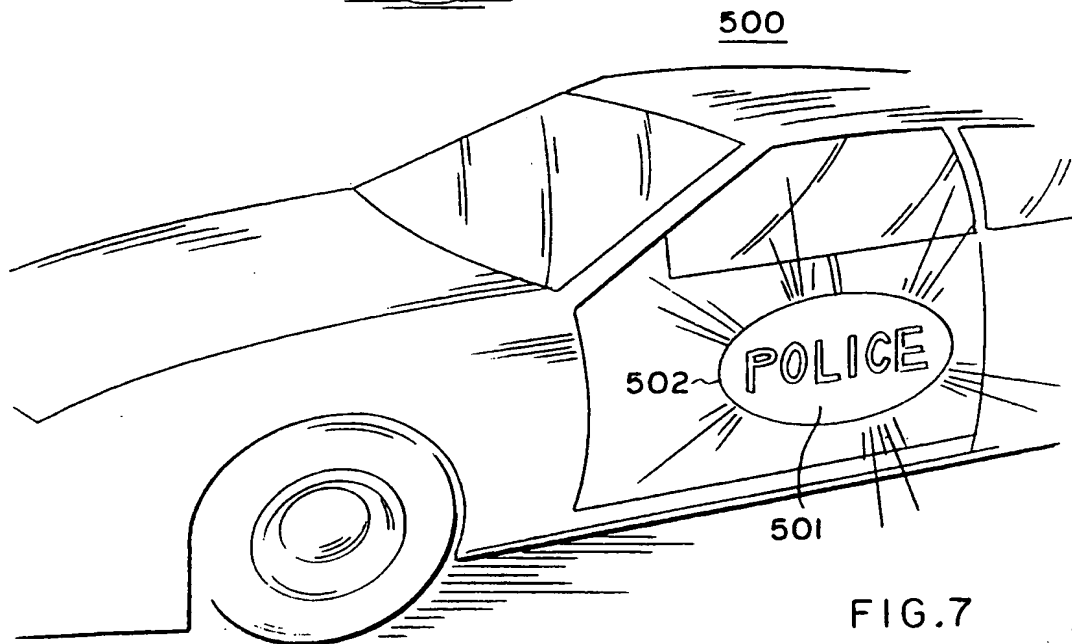


FIG.7

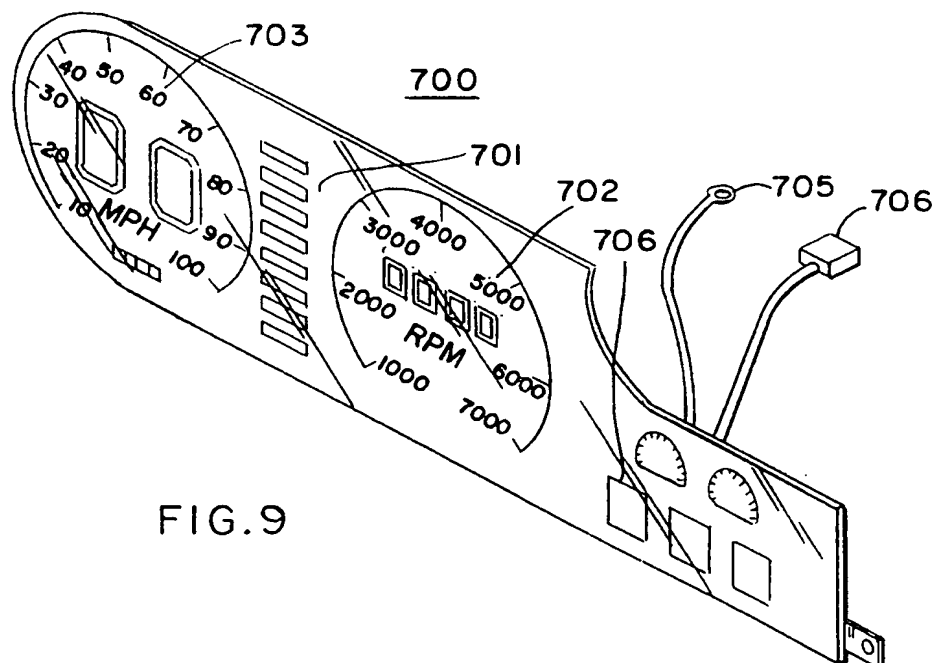
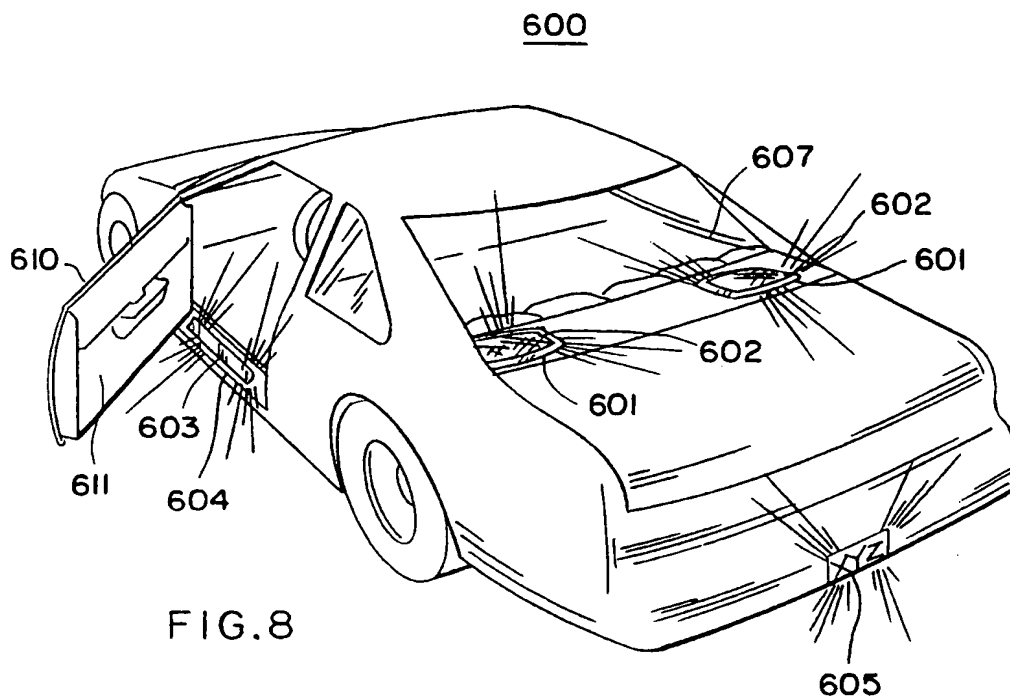


FIG. 10

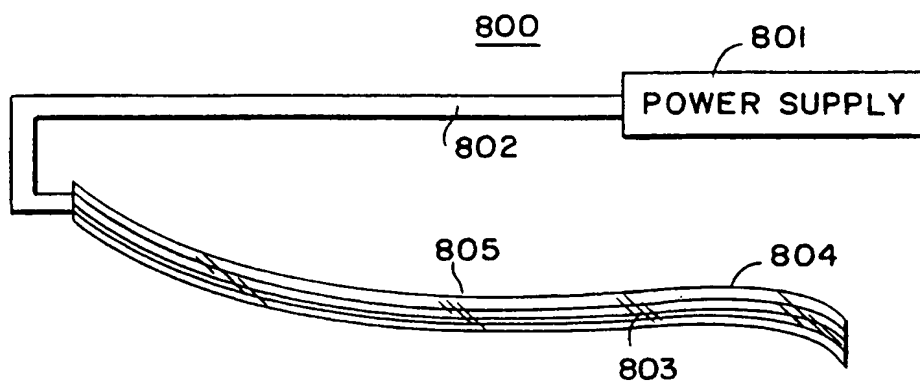


FIG. 11

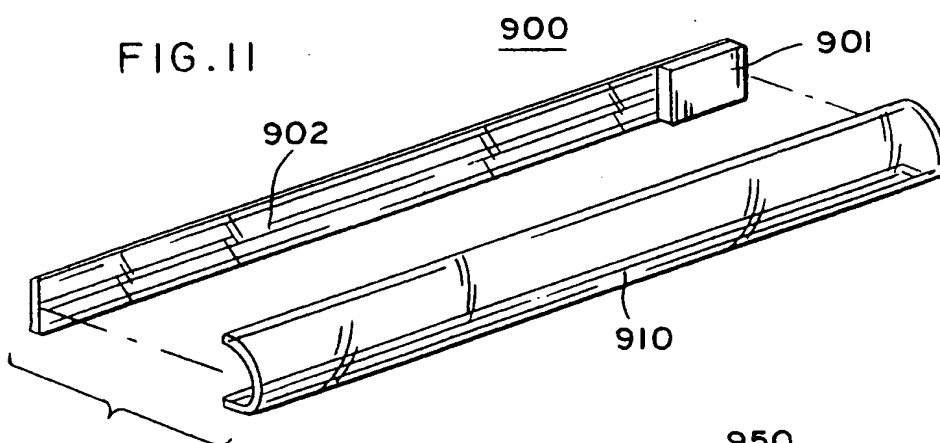
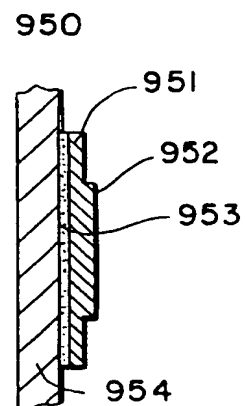


FIG. 12



## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US97/10234

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : F21V 9/16

US CL : 362/61, 80, 84

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 362/61, 80, 81, 82, 83.1, 83.2, 83.3, 84

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, P	US 5,566,384 A (Chien) 15 October 1996 (15.10.96), whole document	1-39
X	US 4,959,759 A (Kohler) 25 September 1990 (25.09.90), whole document	40-43
X	US 5,339,550 A (Hoffman) 23 August 1994 (23.08.94), whole document	44-47
X	US 4,443,832 A (Kanamori et al) 17 April 1984 (17.04.84), whole document	1-4 and 7-39

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

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Date of the actual completion of the international search

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